California Innovation Corridor
Supplier Innovation Initiative

Innovation, Manufacturing/Supply Chain Transformation, Workforce Development

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NASA JPL High-Tech Panel
Doing Business With Large Primes
March 4, 2009

California Space Authority

- **Industry-driven, Membership-based, Non-profit organization**
- **Industry (primes and supplier network), government, military, academia members and stakeholders**
- **California Space Enterprise STRATEGIC PLAN 2007-2010**
- **Five Strategic Initiatives** – providing Voice, Visibility, Edge

- **1: Space Business Development, Retention and Growth**
- **2: California Space Industrial Base Vitality**
  - **Goal: Sustain and enhance California's space-related manufacturing and supplier network and its supporting infrastructure**
- **3: Science, Research and Technology Development**
- **4: Education and Workforce Development**
  - California Space Education & Workforce Institute (CSEWI)
- **5: Public and Policymaker Awareness**

History: Why Supply Chain Transformation Initiative?

- **CSA – Collaborative California Space Enterprise Strategic plan, industry-driven membership and stakeholders determined need for:**
  - "Smart Supplier" Training and Capacity Building
  - Common Requirements and Learning Outcomes
  - Annual Space Manufacturing Supplier Forum
  - Linking Suppliers to Resources
- **U. S. Competitive Initiative – Department of Labor WIRED Initiative**
  - Supply Chain Transformation
    - Ensure common "smart supplier" competitiveness and enterprise-driven outcomes across the supply chain provider/support network
  - Survey
    - compilation of agency, prime & sub 1st level supplier assessments
  - Gap Analysis, Pilots, Programs

NASA JPL High-Tech Panel on Doing Business With Large Primes

- **What do primes look for or expect from a supplier?** *CSA Member input, Forum & Survey results*
  - **Some specific areas to address could be quality of products/services, distribution/delivery or availability of support, financial stability.**
  - **What other criteria are utilized when selecting a supplier?**
    - *Innovative processes, technology & products, mission assurance, systems integration, integrated solutions, life cycle support*
  - **How can I learn about potential procurement opportunities?**
    - *Focused forums with interdisciplinary networking, technology roadmap mapping, in addition to other ways, CSA Member interaction*
- **Do you always compete your opportunities? If so what type of competition do you use, low bid or best value?** *Survey results*
- **Do you require any type of certification to perform work for your company?** ***AS9100,*** *Survey results and assessment opportunity*
- **Why is the small business program and diversity important to your company?**
  - *80% of suppliers have <100 employees*
  - *Up to 80% of Product & Process Content & Innovation is from Suppliers*

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LABOR & WORKFORCE DEVELOPMENT AGENCY

Supply Network Economic Impact

- **Supply Chain Impact – Boeing CA Example**
  - 6,000 suppliers in CA; $5.6B revenue to suppliers
  - 30K direct jobs, avg. salary $56K; 60K indirect jobs
- $46.7M CA taxes paid; $6.3M charitable contributions
- **Supply Chain Impact – CA**
  - 50% of US aerospace, defense, space suppliers in CA
  - 80% WF: employees of companies with less than 100
- OEM:Suppliers - transformation from 80:20 to 20:80
  - 80% innovation needs to come from supply chain:
    - design, test, prototype, production, manufacturability, 99+% QA

Northrop Grumman in California

- **Employees** - Statewide: Almost 29,000 - $3 billion in salaries
  - Southern California: More than 26,000
  - Los Angeles County: Almost 21,000
  - Companywide: 120,000
- **Suppliers** - 6,600 statewide, generating $2.6 billion in business
- Home to the corporate headquarters and the headquarters of two operating sectors:
  - Corporate Headquarters -- Century City (Los Angeles)
  - Integrated Systems -- El Segundo
  - Space Technology -- Redondo Beach
- **Major Programs**: Unmanned Systems, including RQ-4 Global Hawk, MQ-8 Fire Scout, X-47B Unmanned Combat Air System; B-2 stealth bomber; F/A-18 Super Hornet; F-35 Lightning II Joint Strike Fighter; F/A-22 Raptor integrated CNI avionics; Future Combat Systems; FBCB2-Blue Force Tracking; Joint Tactical Radio System; Milstar payload; Airborne Laser; Advanced EHF payloads; EOS Aqua and Aura spacecraft; James Webb Space Telescope; National Polar-orbiting Operational Environmental Satellite System; *Virginia*-class submarine; *Ford*-class aircraft carrier; Trident Strategic Weapons System; CG(X); command, control, and intelligence systems for the Defense Department and intelligence community; tactical data links and interoperability support for the U.S. Navy

Primary Locations	Number of Employees	Major Programs
Azusa	1,000	Space-borne sensing for early-warning systems; weather and ground systems that process C4ISR data from space-based platforms
Carson	1,000	Battle-command systems that provide situational awareness and command-and-control capabilities
El Segundo	4,900	Headquarters of Integrated Systems sector and its Western Region business area, F/A-18 Super Hornet, F-35 Lightning II; advanced development programs
Fort Irwin	880	Logistical support services
Hawthorne	390	Engineering test facility, information technology
Los Angeles	550	Corporate Headquarters
Manhattan Beach	2,500	Space Technology operations
Palmdale (incl. Edwards AFB)	2,000	B-2 maintenance and engineering support; Global Hawk; F-35; aerial targets assembly; Airborne Signals Intelligence Payload sensor integration
Redondo Beach	6,200	Headquarters of Space Technology sector; space, defense, and electronics systems; command, control, and intelligence systems
Sacramento	330	Airborne reconnaissance systems; strategic signal processing systems; intelligence analysis; and telecommunication system products, technologies, and services for national security, defense, public-sector, and commercial customers; Airborne Signals Intelligence Payload sensor development
San Diego	3,800	Unmanned systems development, including Global Hawk, Fire Scout, and X-47B; aircraft carrier support; tactical data links; interoperability support for the U.S. Navy; integrated communications, navigation, and identification avionics for F-35 and F/A-22; command, control, and intelligence systems; commercial information technology services; network communications; software-defined radios
San Jose	590	Command, control, and intelligence systems; commercial information technology services; special signal processing systems; Airborne Signals Intelligence Payload sensor development
San Pedro	370	Joint Mission Planning System -- training and simulation, commercial information technology
Sunnyvale	1,000	Missile launching and handling systems; marine propulsion and power-generation systems; command, control, and intelligence systems
Woodland Hills	1,470	Navigation and positioning systems; identifcation friend-or-foe systems; fiber-optic acoustic sensors; and integrated avionics systems

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November 2008

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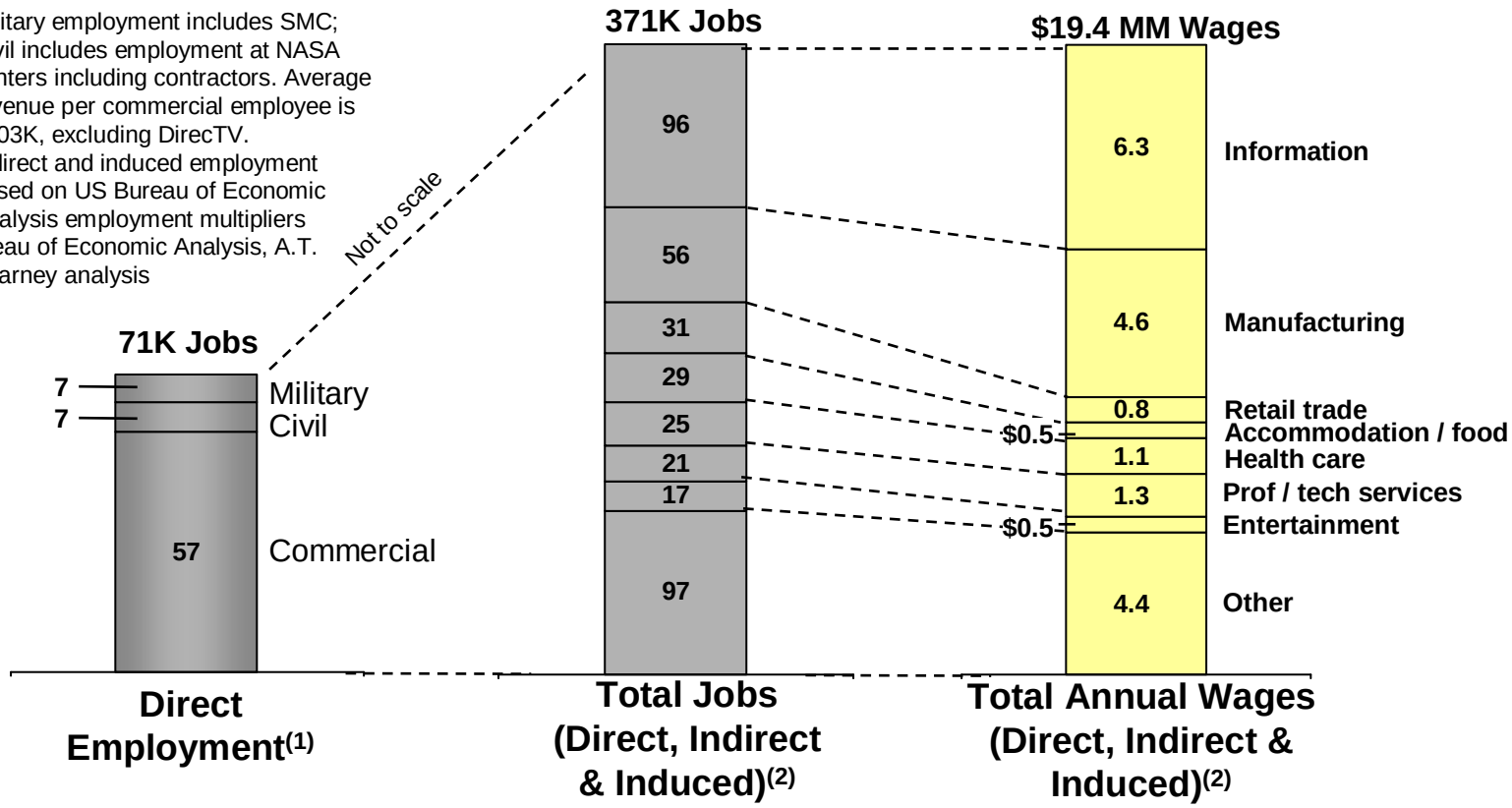
The California space industry has 71,000 direct employees and creates a total of 371,000 jobs across all industries

Space Industry Employment and Wage Contribution to Californian Economy

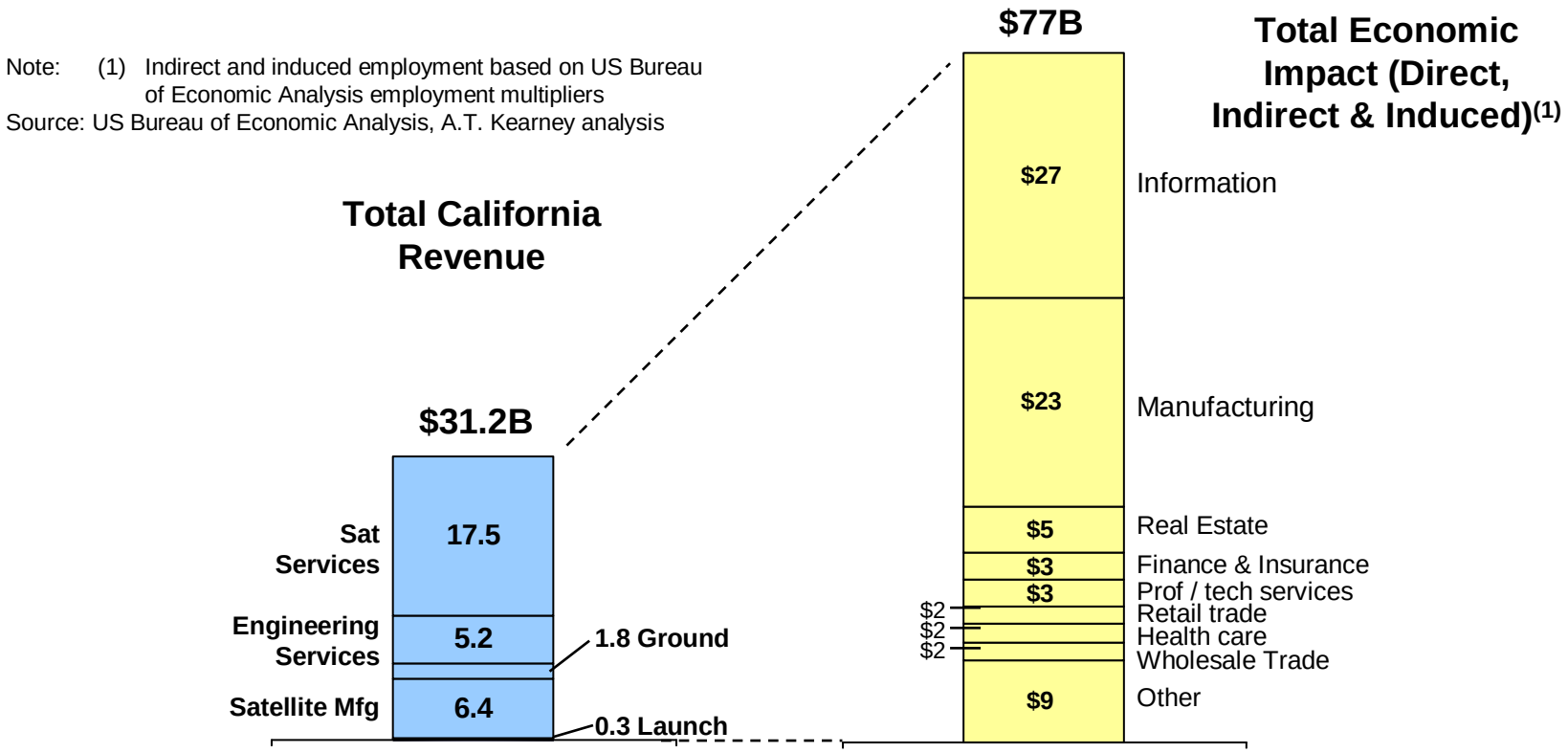
Notes: (1) Military employment includes SMC; Civil includes employment at NASA centers including contractors. Average revenue per commercial employee is $303K, excluding DirecTV.
(2) Indirect and induced employment based on US Bureau of Economic Analysis employment multipliers

Source: US Bureau of Economic Analysis, A.T. Kearney analysis



The California space industry creates $77B in total economic impact from revenues of $31.2B

Space Industry Economic Contribution to the Californian Economy



California Innovation Corridor

Space industry supports a wealth of applications vital to other sectors

Medicine
- Distance diagnosis
- Rural medicine
- Teaching & professional development
- Telemedicine

Entertainment
- Satellite digital audio radio
- Satellite direct-to-home television
- In-flight entertainment
- News
- Sports

Business/Telephony
- Digital voice, fax & paging
- High-speed data transfers
- Satellite internet
- Videoconferencing

Agriculture
- Soil analysis
- Crop moisture sensing
- Pest infestation monitoring
- Herd management

Environmental Monitoring
- Reforestation
- Watershed & vegetation management
- River & stream control
- Air pollution management
- Weather/climate

Energy Management
- Oil pipeline monitoring
- Remote meter reading
- Infrastructure management
- Resource prospecting

Transportation
- Marine & land navigational services
- Rail management
- Infrastructure planning
- Logistics management
- Freight security

Education
- Distance learning
- Satellite-linked classrooms and schools
- Participatory "real-time science"

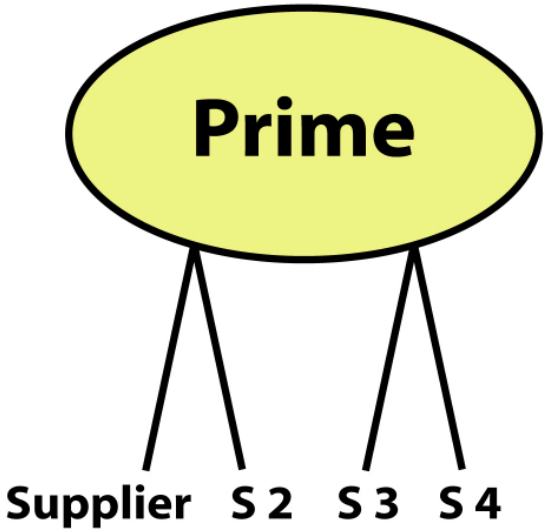
Navigation
- Land, sea, air and space navigational services

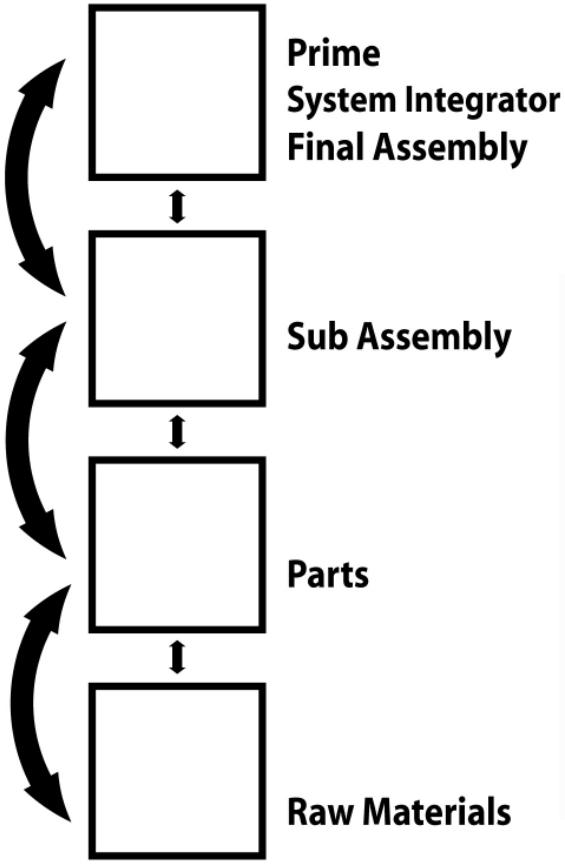
Local Government
- Flood & storm watches
- Forest fire prevention
- Disaster management
- Public safety
- Crime control
- Urban planning

National/Homeland Security
- Intelligence data delivery & collection systems
- Diverse database linkage

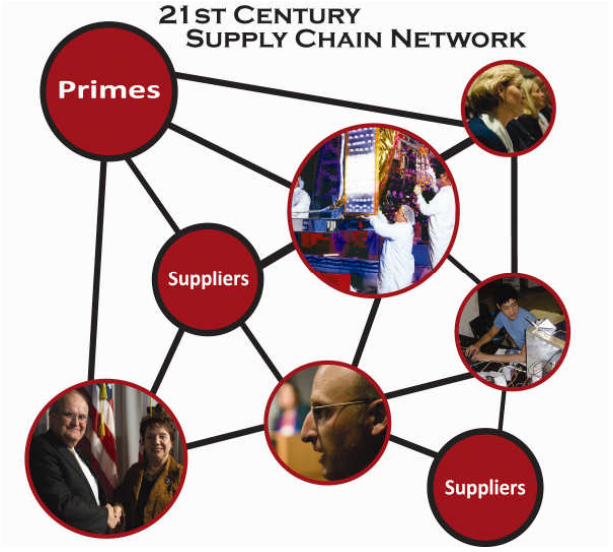
Space Exploration
- Robotic missions
- Planetary missions
- Future manned missions
- Astrobiology
- Flight testing

SUPPLY EVOLUTION





Supply Chain Network



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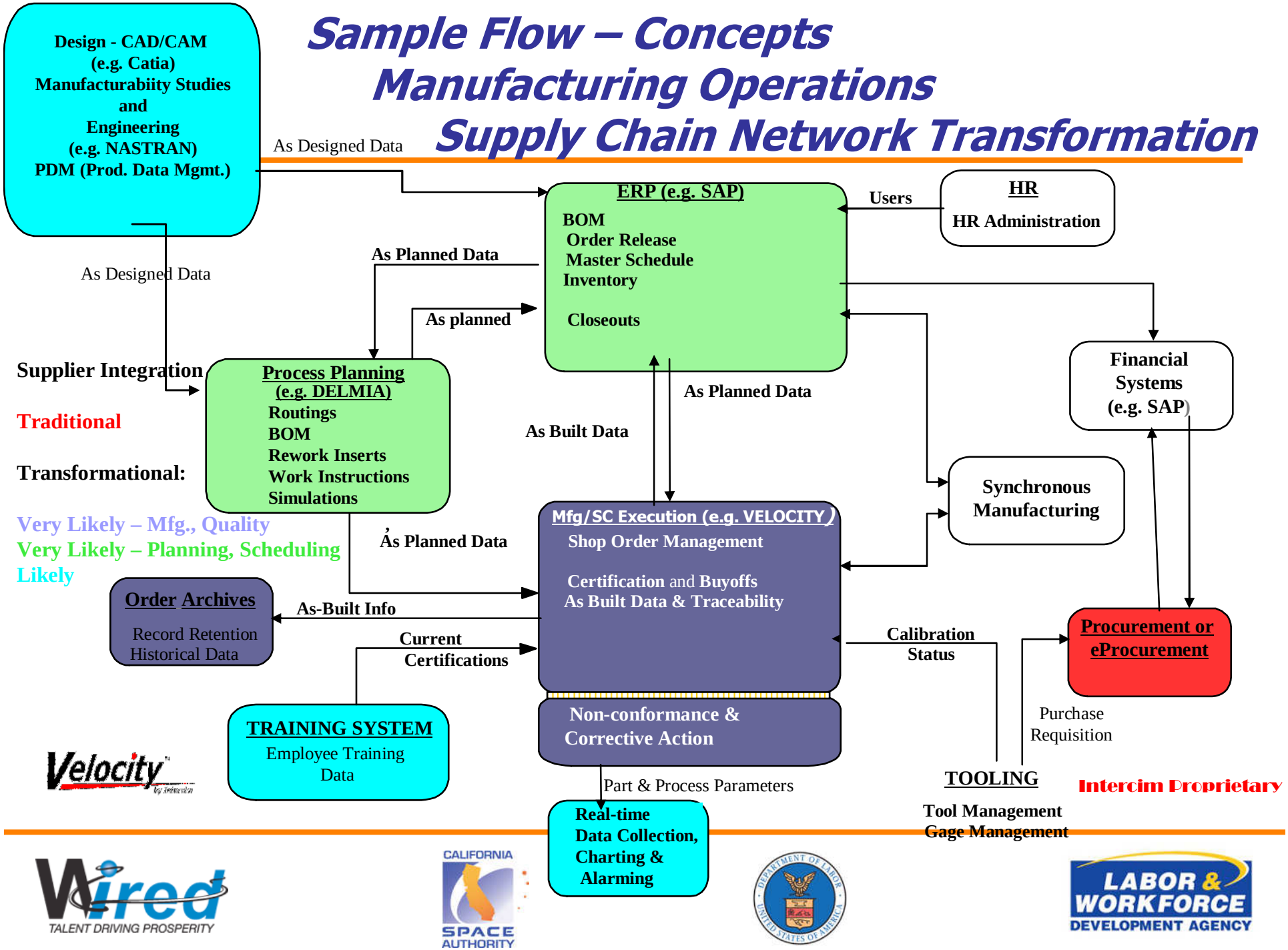
Sample Flow – Concepts
Manufacturing Operations
Supply Chain Network Transformation



Supply Chain Transformation: What it means for Suppliers

- Functions performed by one company are now performed by vertically integrated chains of companies and by dynamic distributed networks of companies
- Changes/disruptions in one layer or node affect the whole system – companies need to be agile and react quickly
- Companies may have to do more functions than before – i.e., design, engineering, quality assurance
- Companies may have to get involved with customers and suppliers earlier in the product development cycle – i.e., requirements definition, design
- Open sharing of more data earlier and more often – i.e., Requirements, Schedule, Quality

Supplier Transformation

- Supplier companies need to collaborate earlier and more often at all supply chain integration points – product design, analysis, manufacturability, quality, manufacturing, distribution, logistics.
- This affects the workforce requirements of these companies.
  - Require systems knowledge – interdisciplinary and problem solving
  - Workforce is highest concern for suppliers
    - Skilled production workers for small and medium size companies
    - S&E for large companies
  - 50% of companies have the required capabilities, used 25% of the time in collaboration up and down the supply chain

Supply Chain Changes & Impacts

The Change	The Impact
OEM operations are increasingly dependent on highly processed purchased material instead of commodity products.	Sourcing of OEM purchases cannot be quickly redirected as it could for commodity products.
Purchased content of OEM's products has risen significantly.	OEM operational effectiveness increasingly depends on supply chain order fulfillment capability.
Suppliers are no longer located near customers, as assumed in TPS.	Distance increases supply interruption risk and decreases supply flexibility.
Asset reduction initiatives have led OEMs to adopt build-to-demand strategies.	Suppliers must support higher magnitudes of OEM order variability.
The market is more demanding. Mass customization is replacing inventory-based product offerings.	Obsolescence is accelerating. Building ahead carries significant market and financial risk.
Competition in greater. Customers expect instant gratification.	Alternate Products are available. Companies that cannot provide products in a timely manner will lose sales.

Extracted from the California Space Enterprise Strategic Plan 2007-2010

Supplier Transformation Survey

FIGURE 8 DESCRIPTION OF SUPPLY CHAIN INTEGRATION WITH CUSTOMERS AND/OR SUPPLIERS

Please indicate the most accurate current description of supply chain integration with your company's customers and/or suppliers:

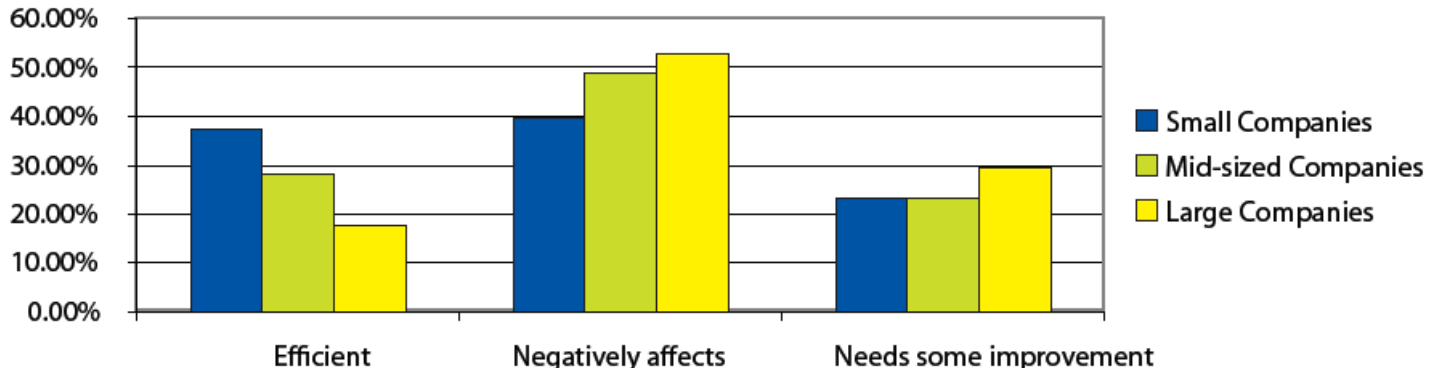
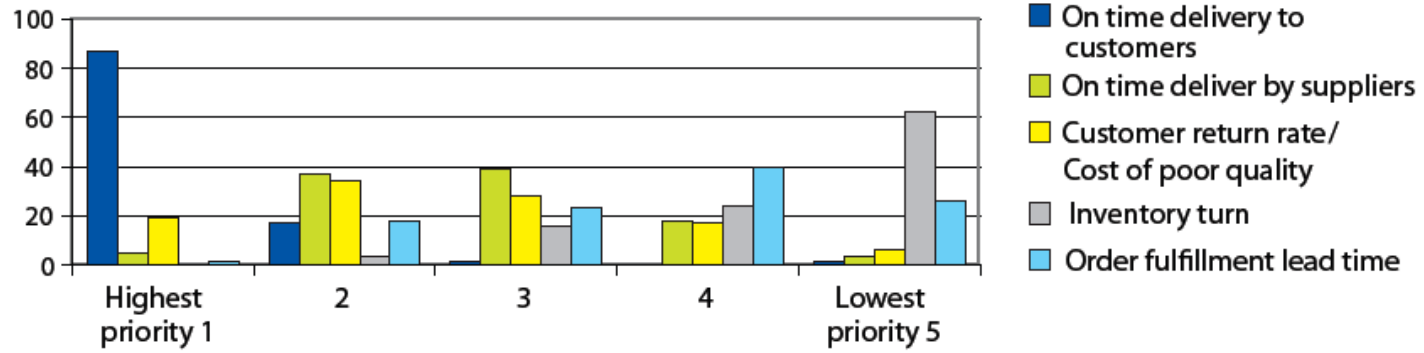


FIGURE 13 PRIORITY OF SUPPLY CHAIN METRICS

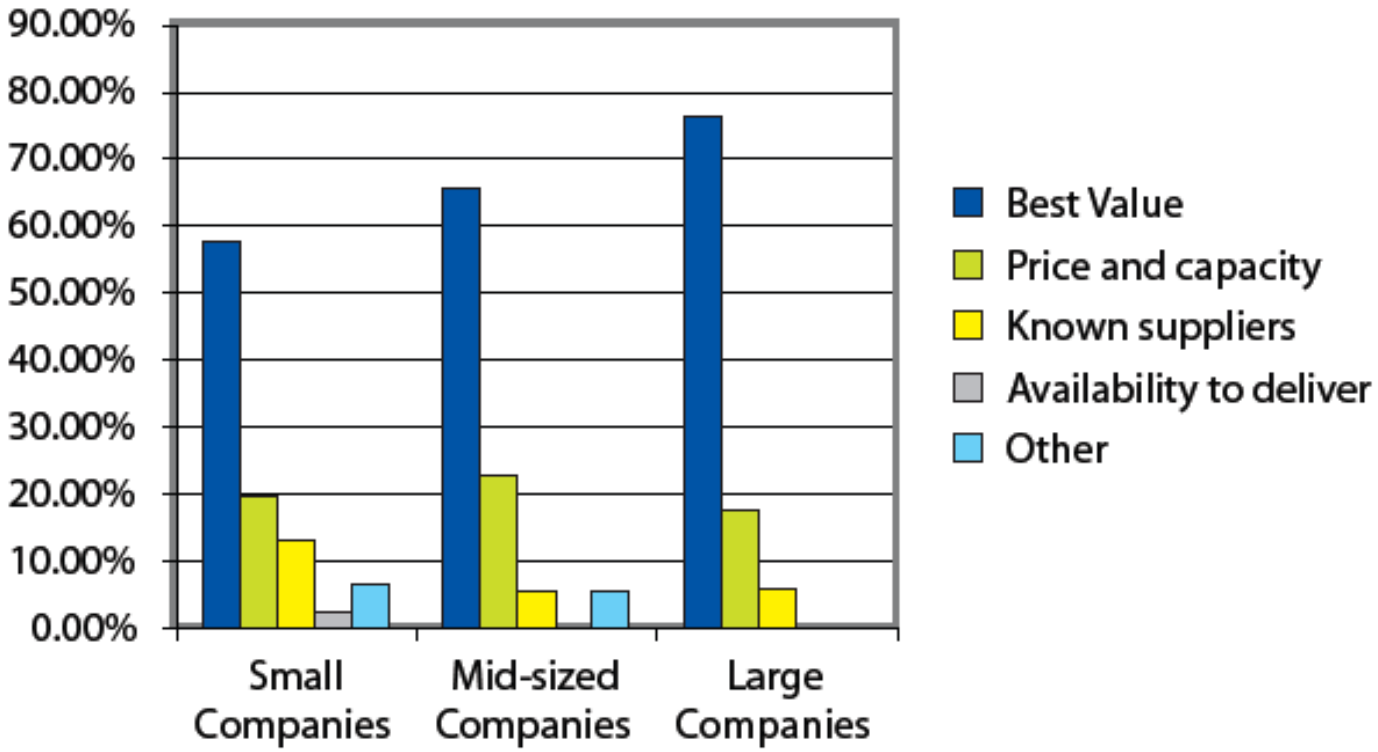
Please put in rank order according to your company's priority of supply chain metrics:



Supplier Transformation Survey

FIGURE 12 HOW SUPPLIERS ARE SELECTED

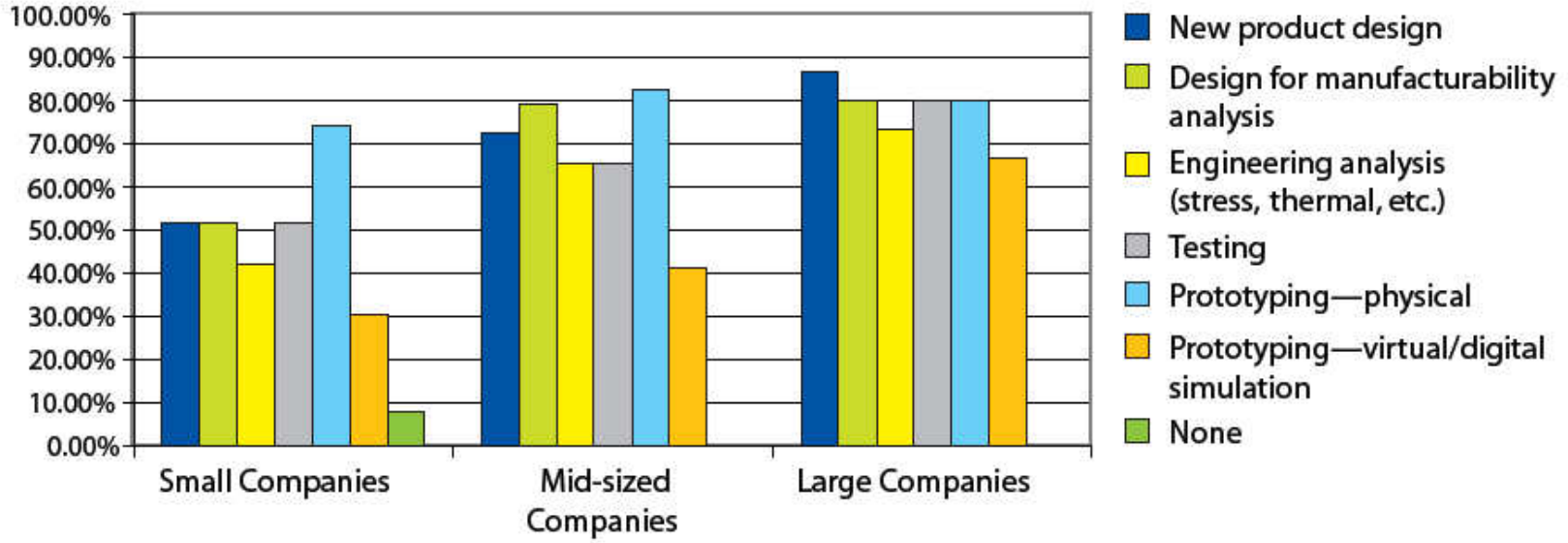
What process does your company usually use to select suppliers?



Supplier Transformation Survey

FIGURE 14 COMPANY CAPABILITIES

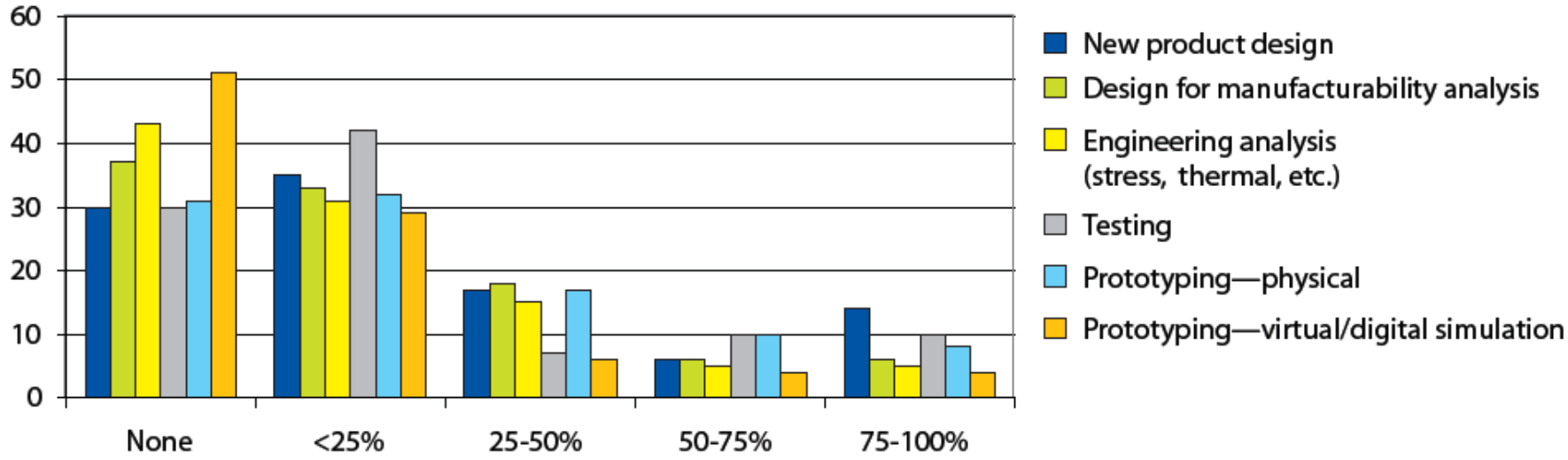
What capabilities exist in your company?



Supplier Transformation Survey

FIGURE 15 PERCENT OF COLLABORATION WITH SUPPLIERS

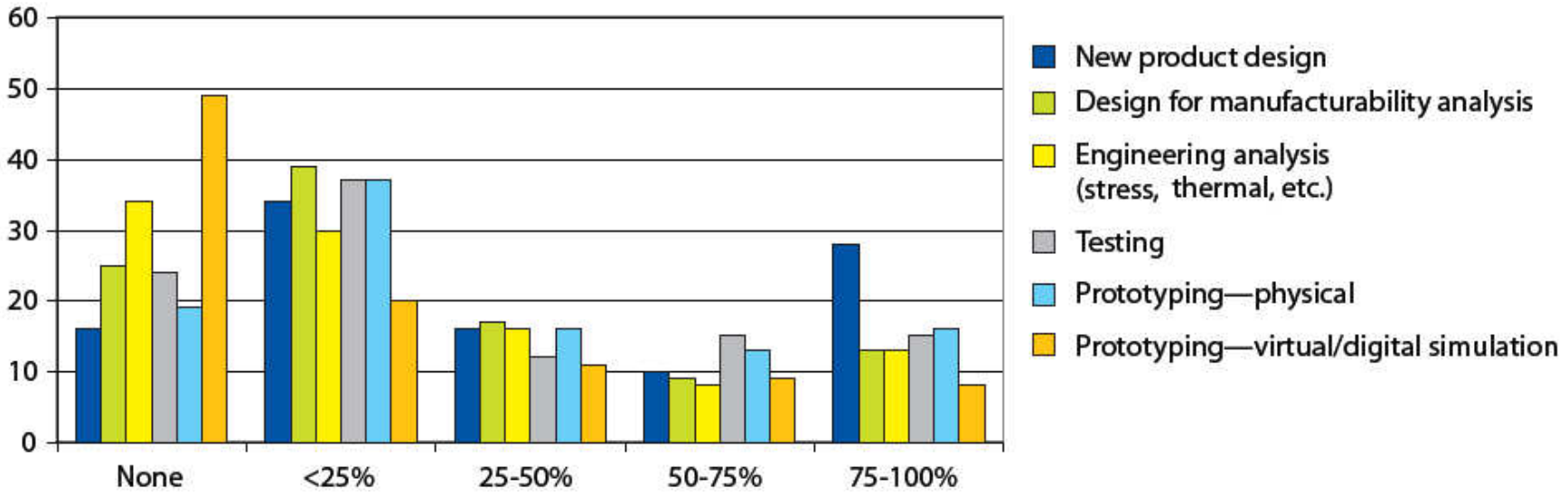
How often does your company collaborate with suppliers in each of these functions?



Supplier Transformation Survey

FIGURE 16 PERCENT OF COLLABORATION WITH CUSTOMERS

How often does your company collaborate with customers in each of these functions?



CSA / DoL Supplier Initiative 2008 Events

Introduction to 21st Century Supply Chain Management 3-Day Seminar

An overview of supply chain management concepts to create overall supply chain value, critical analysis of supply chain management problems, fundamental knowledge of supply chain and logistics management principles and best practices with theoretical knowledge and practical skills relevant for California aerospace and related industry suppliers, with production facility tours and networking with OEM supplier management and engineering management.

September 2 – 4, 2008

ANTELOPE VALLEY COLLEGE

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October 27 – 29, 2008

Supplier Transformation Annual Forum: Supplier Innovations! October 7, 2008

An open forum for discussion and updates on 21st Century Industry Requirements, Realities, Transformation & Resources

Hosted by

Northrop Grumman Corporation, One Space Park Dr., Redondo Beach, CA

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To register go to www.innovateCalifornia.net. Questions: Christine Purcell, christine.purcell@californiaspaceauthority.org, 310.283.7323

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Supplier and Prime Common Requirements: SCM Principles and Technical Workforce

- To address SCM Principles for suppliers and prime contractors
  - Annual Forum – inclusive of agencies, primes, suppliers
  - Specialized Focused ½-day Forums, i.e., Space/IT integration
  - 3-day 21st Century SCM Introductory Course - onsite, open, custom
  - Supplier company capabilities assessment, aligned w/ SAE CMM; potential supplier database
  - Supplier Intelligence database – core, technical, classifications
  - Non-SCM content Forums & Workshops, i.e. IPT, Leadership, "Selling your ideas" for Non-Sales Professionals
  - Innovation Seminar & Webinar series
  - Association Outreach (SAE) & Agency Admin. (ETP)
  - Space/Aerospace Concepts 101 for Non Rocket Scientists
- To address Supplier technical workforce needs:
  - Statewide high tech integrated technical fundamentals assessment, certification and training program
  - Pilot the above with a representative stakeholder group
  - Specific program for a prime and its suppliers as above w/ETP

Potential 2009 Supplier Network Events

- Space-based Global Communication Opportunities
- Quality, mission assurance and contract flowdown
- Digital modeling for discovery, prototyping and manufacturability
- SCM Intelligence using Aerospace portal
- Supplier Capabilities Maturity Model CMM and assessment
- Supplier Network dynamic simulation
- Prime Green Supplier Network Initiatives
- SBIR and technology roadmaps
- Counterfeit Parts Avoidance
- RFID and ROI

Recommendations - Standard supply network practices & standards:

- Determine and implement common industry requirements and supplier assessment processes
  - Consider a common industry first - level assessment process accepted by all agencies & primes
  - Improve industry quality and reduce variance
- Determine and implement equitable and effective contract flowdown
- Ensure US-based supply base for critical security components
- Integration of NASA Quality Leadership Forum (QLF) & DoD Supplier Quality Improvement Council (SQIC) / national Space Suppliers Council (SSC) efforts, standards and practices
- Annual Open Supplier Forum – agencies, primes, all levels of suppliers

Recommendations – Supplier Workforce Development:

- Workforce Development:
  - Applied technology – common assessment, certification and training process at corporate, state and national levels available to all workforce aged citizens
  - Integrated ESL, technical and workplace scenario training
  - Interdisciplinary, problem-solving and industry scenario training
  - Re-examine ETP funding flexibility and consider for OTJ training and application to HR WFD best practice of integrated formal training, experiential and mentor model
  - Systems, life cycle and project management knowledge
  - Consider a Human Investment Tax Credit to drive increased industry relevancy in education - must meet established criteria, be sustained, provide metrics and be leveraged
  - Supply Chain best practices & industry standards training

Supplier Workforce Development:

Career Readiness Certificate Program – CCCs, WIBs

Areas assessed: Applied Math, Reading for Information, Location Information
Optional assessment: Applied Technology – basic electronics, mechanics, thermodynamics, fluid dynamics, problem solving
Where:
Already adopted by many states (FL, IL) and CA regions including Central California / Fresno - Not currently a statewide initiative, but 8 CA regional initiatives; NAM national support
Need industry support/demand – corporate, state/national recognition
Some CCCs & WIBs offer assessment, certification and/or training

Different Levels for Jobs – correlated to 14K jobs, 5K active

- 90% of the jobs (Level 5) -- “Gold” – e.g. electrical engineer, calibration technician, electrician
- 65% of the jobs (Level 4) -- “Silver – e.g. industrial engineering technician, materials inspector, machinist
- 30% of the jobs (Level 3) -- “Bronze” -- e.g. brazer, operating engineer, cashier, file clerk

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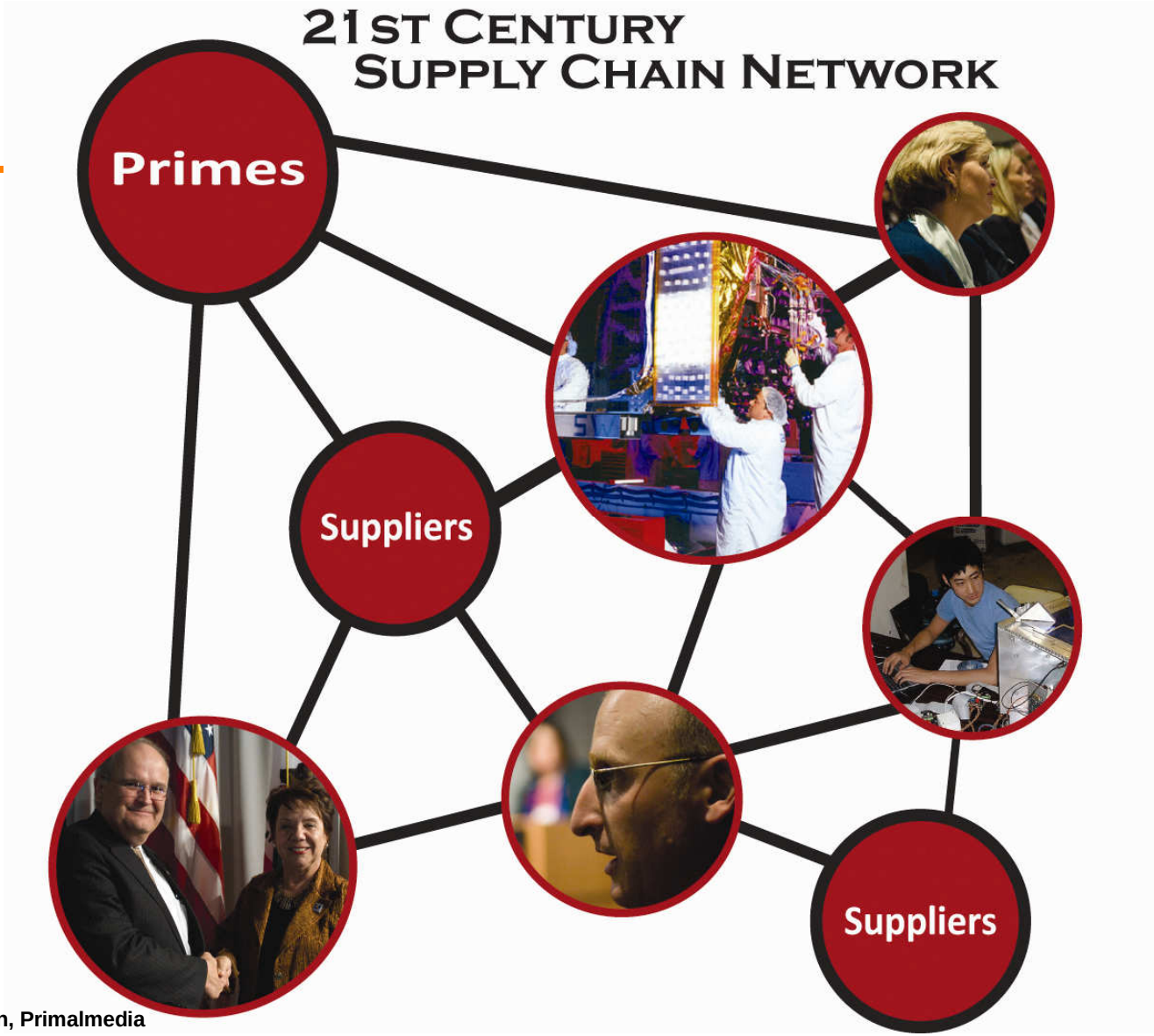
21st Century Supply Chain Network



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Department of Labor United States of America

Labor & Workforce Development Agency